

# LIVING WORLD



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Life is found in extraordinary habitats

- ① Hot springs
- ② Cold mountains
- ③ Deciduous forests
- ④ Oceans
- ⑤ Fresh water lakes
- ⑥ Deserts

① Ecological conflict

② Cooperation among members of population

among population of community

③ Molecular traffic inside a cell

makes us deeply

what is life

reflected on

★ Ernst Mayr - ① Darwin of 20th century  
② Gave def. of biological species

What is living?

- interact
- Growth
- Reproduction
- ability to sense environm.
- metabolism
- ability to self replicate

emergence

self organ  
rise

mount a suitable response

ALL ORGANISMS GROW →

① Increase in mass

② Increase in number

→ twin charact. of Growth

Multicellular org.

Grows by cell division

Unicellular org.

★ Plants → Growth by cell division occurs continuously throughout life span  
Animals → Growth seen upto a certain age.

observed in vitro  
by counting no. of cells

★ Cell division occurs in "certain" tissues → to replace lost cells.

★ Majority of higher animals → Growth  
plants → Reprod. } mutually exclusive events.

\* One must remember, ↑ in body mass = growth.

if we take this as a criterion

Accumulation of material on the surface

This kind of growth

mountains  
Boulders  
sand mounds

Non living objects grow

• In living org - growth is from inside

Growth cannot be taken as defining property of living org.

conditions under which it can be observed in all living beings have to be explained.

Then, it's a charact. of living system.

★ A dead organism does not grow.

## REPRODUCTION

• In multicellular org repr. refers to Production of progeny more or less similar to those of parents.

Invariably we refer to Sex. reproduction

Asexual Reprod.

★ Fungi

Fragmentation

proth. mass

multiply spread

easy due to millions of asexual spores

Budding

lowest org.

Yeast

Hydra

Planaria True reg. generation



Unicellular org. → Bact. → Unicellular algae → Amoeba

Reproduction  
↑ synonymous  
growth. } i.e. ↑ in no. of cells.

Do not reproduce. ~~sterile marker bees~~ ~~infertile human couple~~

Hence, repr. also cannot be all inclusive defining characteristic of living org.

\* NO, non-living object is capable of reproducing / replicating by itself

(defining feature of all living org.)

## METABOLISM

→ All living org - made of chemicals

Small → Big } Belonging to various sizes

Chemical react.

OR

Metabolic react.

these conversion

constantly being made and changed into some other biomolecules.

classified by function sizes

• 1000s of metabolic reactions occurring simultaneously inside all living organism

• All → plants → animals → fungi → microbes

exhibits metabolism

Sum total

of all the chemical rxns occurring in body

METABOLISM

\* NO non living object exhibits metabolism

\* An isolated metabolic reaction(s) outside the body of an organism, performed in a test tube is neither living nor non living.

\* demonstrated outside the body in cell free systems.

Isolated metabolic rxns in vitro are not living things but surely living rxns.

★ Cellular Organisation of the body is defining feature of life forms.

→ defining property

## CONSCIOUSNESS

Most obvious

technically complicated

feature of all living organism is

We sense enviro. through our sense organs.

ability to sense the environment. Stimuli

other organism

physical → chemical → Biological

Plants - respond to External factors

light → water → Temp → pollutants

All org. from prok → eukary. (most complex)

\* Photoperiod affects reproduction in seasonal breeders both → plants → animals.

can sense & respond to environmental cues

\* All org. → "aware" of surrounding

All org. registers chemical entering the body. This is consciousness

\* Human being → "(self consciousness)" aware of himself

Human beings - more difficult to define living state

Patient is otherwise brain dead & has no self-consciousness

heart

lungs

Virtually supported by machines which replace

Coma people



Living phenomena — due to underlying interactions.

Properties of tissue not in the constituent cells but arise as a interaction among the cells.

Properties of cellular or organisms not present in molecular constituents of organisms but due to interaction among them.

results in

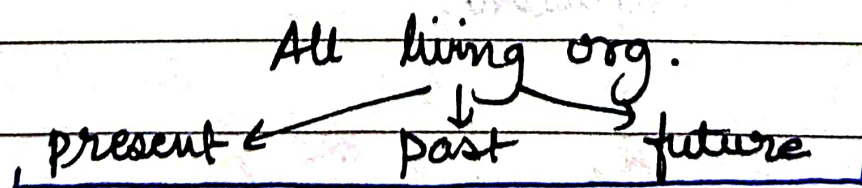
- Emergent properties at a higher level of organisation.

\* This phenomena is true in hierarchy of organisational complexity at all levels.

↓ Thus

- Living org. capable of
  - self replicating
  - evolving
  - self regulating interactive systems. capable of responding to external stimuli.

- Biology — story of life on earth  
Story of evolution of living org. on earth.



linked to one another by sharing

Common genetic material

but to varying degrees



# Diversity in Liv. Beings.

born 2 inspire

Date \_\_\_\_/\_\_\_\_/\_\_\_\_

As we explore —————→ new areas

and even

old ones

new org are continuously being identified.

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AIR 1747

NCERT THREAD NOTES

Area of observation & Variety of organism

\* No. of species known & described range

↓  
1.7 - 1.8 million

Biodiversity - Number & Type of organisms present on earth.

Nomenclature - Standardizing the naming of living organism.

possible only when

Identification - Description of organisms correctly and we know to what org. the name is attached to



ICBN - International Code for Botanical Nomenclature

ICZN " " " Zoological " " "

Scientific name ensures that each org. has only one name.

Naming System <sup>given by</sup> Carolus Linnaeus <sup>to</sup> Binomial Nomenclature

## Universal Rules of Nomenclature:

1. Biological names - Generally in Latin & written in italics

(1) Latinised OR (2) derived from Latin  $\rightarrow$  irrespective of their origin.

2. Biological name  $\rightarrow$  First word  $\rightarrow$  Genus  
 $\rightarrow$  Second word  $\rightarrow$  Specific epithet

3. Both the words - in Biological name  $\xrightarrow{\text{when handwritten}}$  separately underlined OR  $\xrightarrow{\text{Latin origin to indicate}}$  printed in italics

4. First word - genus  $\rightarrow$  starts with capital letter  
Second word - Specific epithet  $\rightarrow$  starts with small letter

\* Name of author  $\rightarrow$  appears after Specific Epithet

$\rightarrow$  written in abbreviated form  
 $\rightarrow$  *Mangifera indica* (Linn)  $\rightarrow$  indicates species was described by Linnaeus.

TAXA  $\rightarrow$  (can indicate categories at very diff. levels)

Eg  $\rightarrow$  mammals (Class)  
 $\rightarrow$  animals (K)  
 $\rightarrow$  dogs (Canidae - Family)

Classification - process by which anything is grp into convenient categories.

Scientific term for categories  $\rightarrow$  taxa

unique to

Ecological information of organism  
Ext & int. structure  
Structure of cell  
Development process

$\leftarrow$  Basis of Modern Taxonomy

- 1) Characterisation
- 2) Identification
- 3) Classification
- 4) Nomenclature

basic to

Taxonomy

process of classification

Based on characteristics all living organism can be classified into different taxa.

Human being wanted to know more about org  $\xrightarrow{\text{w.r.t}}$  their own use.

Human beings - found sources for their BASIC NEEDS  $\rightarrow$  food, clothing, shelter.

\* Earliest Classification based on uses of various organism.

they also wanted to know relationship among organisms

Systematics  $\rightarrow$  Latin origin  $\rightarrow$  Linnaeus - *Systema Naturae* (title of his publication)

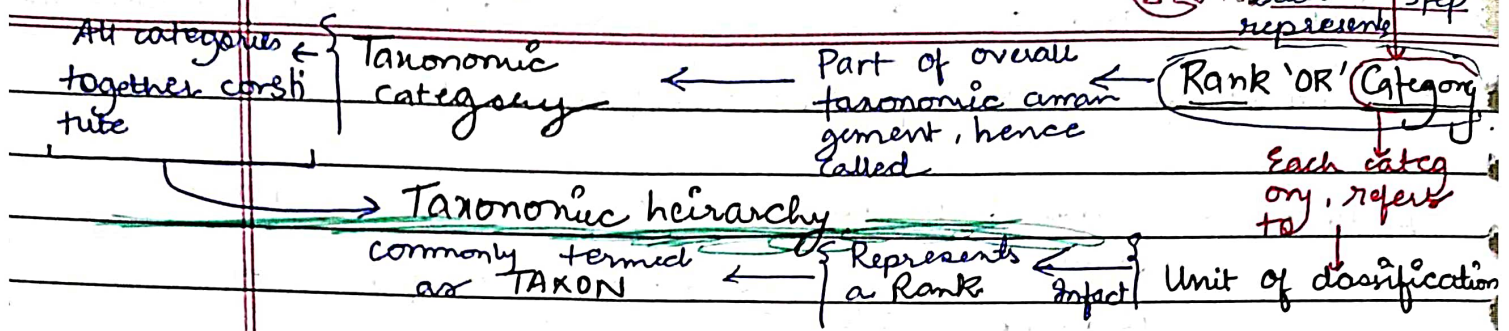
Systematic arrangement of organism

1) Identification  
2) Nomenclature  
3) Classification  $\rightarrow$  included in Systematics  $\rightarrow$  takes into account evolutionary relationships b/w organisms.



# TAXONOMIC CATEGORIES

Classification → NOT a single step process → is a hierarchy of step



Insects → represents → a grp of organisms sharing common feature like 3 pairs of jointed legs.

Thus given Rank or Category → Thus, insects are recognizable concrete objects that can be classified.

\* Grp represents category denotes Rank/Taxon represents Unit of classif.\*

\* These taxonomic grps/category are distinct biological entities & not merely morphological aggregates. Imp

Taxonomic Studies → of all known organism → led to development of common categories

[Species - lowest category in both plants & animals.]

Kingdom Phylum Division

Basic Requirement → Knowledge of characters of an individual or group of organisms → To classify them

Imp Identifying similarities & dissimilarities among the individuals of same kind of organisms as well as of other kinds of organisms.

## SPECIES

• Grp of individuals with fundamental similarities → species → One should be able to distinguish one species from another

\* Each genus may have one OR more specific epithets. Morphological similarities but with representing diff. organism. distinct morphological difference.

\* Panthera → leo → lion, pardus → leopard, tigris → tiger. \* Solanum → tuberosum (potato), melongena (brinjal), nigrum (mirkoi). \* Homo → sapiens

GENUS comprise of Grp of related species which has more chr. common in comparison to species to other genera.

aggregates of closely related species

(Potato & Brinjal → same genus (Solanum))

(Lion, tiger, leopard → same genus)

(Felis - genera of cats)



## FAMILY

→ grp of related genera with still less no. of similarities as compared to  
 → characterised on  
 Veg. features of plant species  
 Reprod. features of plant species  
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 Canidae - dogs family  
 Panthera  
 Felis → Felidae

[Natura, Petunia, Solanum] → Family - solanaceae

**ORDER** → Assemblage of families which exhibit a few similar chrs.

[Plant families] → Comulacae  
 Solanaceae → Order: polymoniales  
 (based on floral chr.)

are less in no as compared to diff. genera included in a family

[Felidae Canidae] order Carnivora

**CLASS** → includes related orders

Mammalia class  
 orders: Primata → monkey, gorilla, gibbon  
 Carnivora → tiger, cat, dog

**PHYLUM** fishes amphibians Reptiles birds Mammals

Division. In case of plants  
**CHORDATA** → common features: notochord, dorsal hollow neural system

**KINGDOM** → plantae - plants  
 Animalia - animals

Lower the taxa, more the characteristics that the members share within taxon.

K  
 P/D  
 C  
 O  
 F  
 G  
 S

Ascending order  
 No of common chr. decreases  
 Difficulty of determining the relationship to other taxa at same level.  
 problem of classification more complex

broad categories (7) → however Taxonomists have developed sub-categories to facilitate more sound & scientific placement of various taxa.

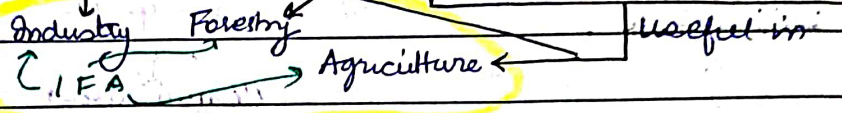
Common name	Bio. name	G	F	O	C	P/D
Man	Homo Sapiens	Homo	Hominidae	Primate	Mammalia	Chord.
Housefly	Musca Domestica	Musca	Muscidae	Diptera	Insecta	Arthrop.
Mango	Mangifera Indica	Mangifera	Anacardiaceae	Sapindales	Dicotyledonae	Angi
Wheat	Triticum aestivum	Triticum	Poaceae	Poales	Monocotyledonae	Angi

Genus — Tribe — Subfamily



# TAXONOMICAL AIDS

Taxonomic studies of various species of   
 ↓   
 In general knowing our   
 ↓   
 Bio-resources   
 ↓   
 Diversity



These studies would require   
 ↓   
 intensive laboratory   
 ↓   
 correct classification   
 ↓   
 identification   
 ↓   
 requires   
 ↓   
 field studies

The collection of actual specimens of   
 ↓   
 prime source of taxonomic studies.   
 ↓   
 plants   
 ↓   
 animals

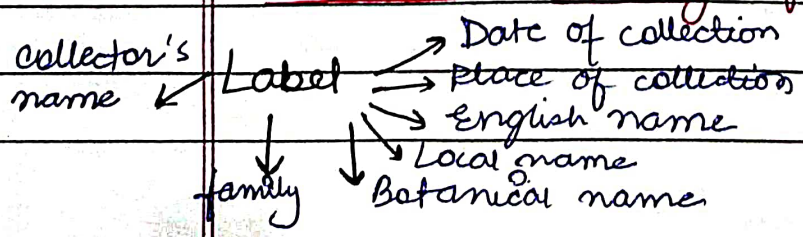
- These are also fundamental to studies & essential for training in systematic
- Used for classification of an organism, & information gathered is also stored along with the specimens.
- In some case, specimens → preserved for future studies
- Biologists have - established procedures & techniques, to store & preserve inf. as well as specimens.

## HERBARIUM

"Storehouse of collected plant specimens that are   
 ↓   
 dried   
 ↓   
 pressed   
 ↓   
 on sheets   
 ↓   
 preserved

These sheets are arranged acc<sup>n</sup> to universally accepted system of classification.

These specimens → with description on herbarium sheets,   
 "storehouse" or "Repository" for future use   
 ↓   
 become



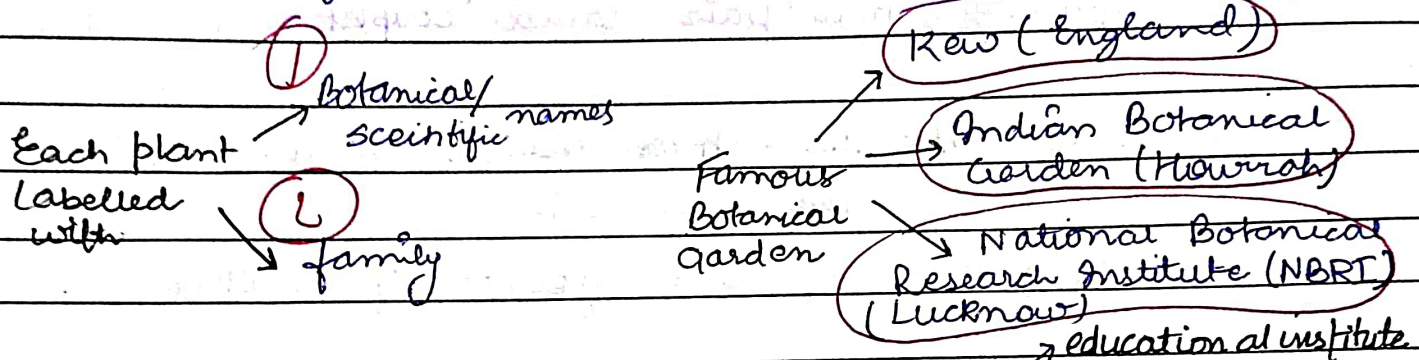
Herbaria serves as quick referral systems in taxonomical studies



# BOTANICAL GARDENS

Specialised Garden → have collection of → Living plants for reference.

\* Plant <sup>P</sup> species grown here are for - identification purpose.



## MUSEUMS

• Biological museum set up in

Have collection → Preserved

- Plant specimen
- Animal specimen

for ① Study & ② Reference

Specimen <sup>preserved in</sup> → Jars/Containers → in → Preservative soln.

\* Plant & Animal specimen may also be preserved as [dry specimens] \*

Insects → Preserved in insect boxes after

- ① collected
- ② Killing
- ③ Pinning

Larger Animals

- Birds
- Mammals

usually ① stuffed & ② preserved.

\* Museums often have collections of skeletons of animals too.

## ZOOLOGICAL PARKS → places → Wild animals are kept

enable us to learn about their

food habits      Behaviour

① in Protected environment  
② under human care

TANISHA SACHAN

AIR 1747

NCERT THREAD NOTES

All animals in zoo → provided with → conditions similar to their natural habitat.

• Children love visiting there.

Commonly called → Zoos



# KEYS <sup>→ generally, analytical in nature</sup>



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- Taxonomical Aid
- Used for - identification of plants & animals both
- Based on - similarities & dissimilarities

Keys are based on → contrasting characters

↓  
Generally, in a pair called 'couplet'.

- It represents the - choice made b/w 2 opposite options  
this ↓ results in

Acceptance of only one & rejection of the other.

- Each statement in a key - Lead

\* Separate taxonomic keys are required for each taxonomic category for identification purposes.

← { family ← Genus ← Species

Some other means of recording description :  
(They help in correct identification)

## FLORA

Actual account of habitat & distribution of plants of a given area.

These provide index to plant species found in a particular area.

## MANUALS

Names  
~~names~~  
Providing information for identification of names of species found in an area.

## MONOGRAPHS

Contains information on any one taxon.

helps in disseminating inf. for further taxonomic studies by taxonomists prepared